

High-resolution contrast-enhanced, susceptibility-weighted magnetic resonance imaging at 3 in patients with brain tumors

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Introduction

To demonstrate susceptibility effects (SusE) in various types of brain tumors with 3T HR-CE-SW-MRI and to correlate SusE with PET and histopathology

Material and Methods

Eighteen patients with brain tumors, scheduled for biopsy or tumor-extirpation, underwent high-field (3T) MRI. In all patients an axial T1-SE-sequence and a SWI-sequence before and after i.v application of a standard dose of contrast-agent (MultiHance®) was obtained. Seven patients preoperatively underwent PET. The frequency and formation of intralesional SusE in all images were evaluated and correlated with tumor grade as determined by PET and histopathology. Direct correlation of SusE and histopathological specimens was performed in six patients. Contrast enhancement of the lesions was assessed in both sequences.

Results and Discussion

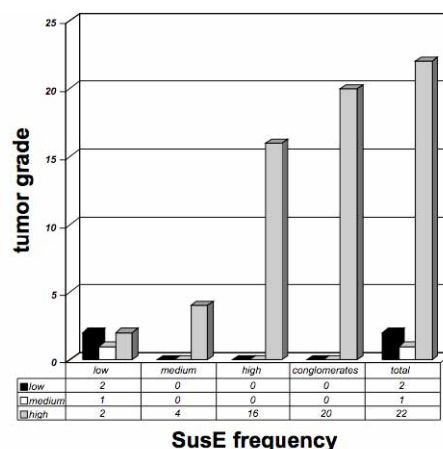
High-grade lesions demonstrated either high or medium frequency of SusE in 91%. Low-grade lesions demonstrated low density of SusE or no SusE. (Tab.1) Correlation between intralesional frequency of SusE and histopathological as well as PET tumor grading was statistically significant (Tab2.). Contrast enhancement was equally visible in both SW- and spin-echo-sequences. Side-to-side comparison of tumor areas with high frequency of SusE and histopathology revealed that intralesional SusE reflected conglomerates of increased tumor microvasculature (Fig.1).

Conclusion

3T HR-CE-SW-MRI shows both intratumoral SusE not visible with standard MRI and contrast-enhancement visible with standard MRI (Fig.2). As frequency of intratumoral SusE correlates with tumor grade determined as by PET and histopathology, this novel technique is a promising tool for non-invasive differentiation of low-grade from high-grade brain tumors and for determination of optimal area of biopsy for accurate tumor grading.



Fig.1: Thirty-six year old male patient with a primary malignant brain lesion respectively a glioblastoma WHO IV temporo-mesial right: Axial contrast-enhanced 3T- HR-SW-MR images demonstrated a brain lesion with high frequency of SusE and marked contrast-enhancement in both T1-weighted SE and HR-SW sequence. Intralesional SE (yellow asterisk in Fig.1) could be correlated to conglomerates of vessel proliferations.



Tab.1: Cross tabulation of histopathological tumor grade and frequency of intralesional SusE and SusE conglomerates

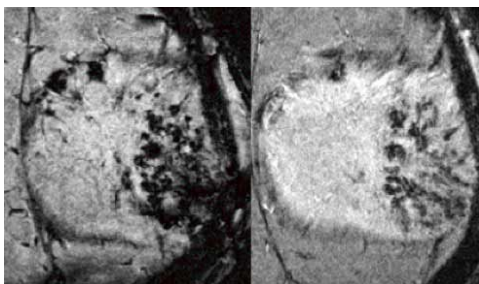
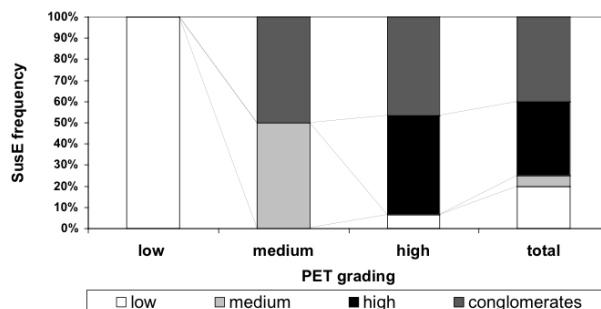


Fig.2 Fifty-nine year old male with huge plasmocytoma frontoparietal left with osteolytic bone-destruction: Axial contrast-enhanced 3T- HR SW- MR imaging demonstrated two parts of the huge frontoparietal mass with one high frequency of SE conglomerates and one with low frequency of SE. Marked contrast-enhancement of the mass was observed in HR-SW - MRI sequence.



Tab.2: Cross tabulation of PET tumor grade and frequency of intralesional SusE and SusE conglomerates